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Name of Applicant:

KARL KLEIN

Address of Applicant: 36 Torroodun Street, Mount Waverley, in the State of Victoria, Commonwealth of Australia.

Actual Inventor:

KARL KLEIN

A. TATLOCK & ASSOCIATES
PATENT & TRADE MARK ATTORNEYS

19 Drummond Street

Carlton 3053

Victoria Australia

POST OFFICE BOX 339

CARLTON SOUTH 3053

Complete Specification for the invention entitled: "IMPROVED CARTON ERECTING APPARATUS"

The following statement is a full description of this invention, including the best method of performing it known to me:—

Note: The description is to be typed in double spacing, pica type face, in an area not exceeding 9 $\frac{1}{2}$ " in depth and 6 $\frac{1}{2}$ " in width, on tough white paper of good quality and it is to be inserted inside this form.

This invention relates to apparatus for erecting cartons and specifically apparatus for erecting cardboard cartons which are normally delivered flat.

There have previously been proposed carton
5 erecting apparatus which has operated satisfactorily but
which has suffered from two major disadvantages. Firstly,
the equipment has been extremely expensive and thus has
not been justified unless it is to be run continuously
and secondly the setting up time for the equipment has
10 been relatively great and has needed skilled operators.

It is an object of the present invention to provide an apparatus which is effective in erecting cartons, which is relatively simple and therefore relatively cheap and which, at the same time, can be set up for
15 various size cartons by operators without great skill.

The invention includes, in its broadest sense, apparatus for erecting cartons including a feed chute into which cartons for erection can be placed, restraining means entering into the chute adjacent the open lower end thereof which prevent the cartons from freely leaving the chute, a conveyor passing beneath the open lower end of the chute which is arranged to positively transport cartons when they leave the chute, forming means adjacent one side of the chute and above the conveyor by which
20 cartons on the conveyor are caused to assume a fully erect condition and means to selectively move individual cartons from the open lower end of the chute onto the conveyor
25

adjacent the forming means.

Preferably the arrangement is such that when the carton is removed from the lower end of the chute, it is at least partially open and as it is moved downwardly towards the conveyor belt it is fully open because of contact with the forming means and as it is transported between the forming means and the conveyor, it is distorted beyond the fully open position so that when it leaves the forming means it returns to an open position to enable the tabs, if any, and one of the end flaps to be folded in.

In order that the invention may be more readily understood, I shall refer to the accompanying drawings in which:-

15 Figure 1 shows a side elevation of the operative portion of the machine,

20 Figure 2 is a section along line 2-2 of Figure 1 showing the arrangement of the lower portion of the forming means and its inter-relation with the conveyor, and

25 Figures 3, 4, 5 and 6 show the steps in the operation of removing a carton from the chute, delivering it to the former and the movement of the carton through the former.

In Figure 1, I have a feed chute 10 which may be

made of metal either by casting or fabrication, which chute is designed to accept only one size of carton and which may be readily removed from the machine, together with its associated former simply by undoing set screws

5 11.

At the lower edge of the chute on one side thereof, there is a ledge 12 which extends slightly into the chute and on the other side there may be a similar ledge or a spring member 13 which also extends into the

10 chute.

When a stack of cartons 14 are placed into the chute, the edges of the lowermost carton strikes the ledge 12 and the ledge or spring 13 so that the carton stack is retained. The cartons are delivered so that

15 the upper side is to the left of the chute, the lower side is to the right of the chute and the sides of course are interconnected by the ends.

Mounted beneath the chute there is a conveyor

15 which may comprise a pair of chains 16 from each of

20 which a plurality of spaced pins 17 extend outwardly.

As illustrated, these pins may be mounted on plates 18 which extend between the chains and therebeyond so that the chains do not obstruct the operation of the feed arm which will be described herein-
25 after.

The former 19 is so shaped to have a leading portion 20 which extends into the mouth of the chute

approximately the same distance as does ledge 20, a curved intermediate portion 21 and a sloping trailing portion 22. Located beneath the former, there is a guideway 23 onto which the cartons to be erected are delivered,
5 which guideway may have a central slot 24 through which the pins 17 extend and by means of which the cartons are caused to move along the guideway beneath the former.

The other major portion of the apparatus is the feeder arm assembly 24 which comprises an arm 25 which
10 at one end is fitted as a crank to a rotating member 26 which may be directly connected to a motor or which may be driven by a shaft, the connection being by pivot 27 and which, partway along its length, has pivotally connected thereto, at 28, a link 29 which in turn is
15 pivotally connected to the body of the machine at 30. At its outer end the arm 25 carries a suction head 31 to which there is fitted one or a plurality of suction cups 32, the number depending upon the size of the carton to be assembled.

20 Slightly beyond the trailing edge 22 of the former, there may be a side guide member 33 which causes one of the end flaps of the carton being erected to be raised and inserted and if the carton is provided with side tabs, there may also be means to fold these inwardly
25 prior to the end being folded.

Such mechanisms or devices are known in the art, but they do not specifically constitute part of the

invention of the application and as such, they will not be described.

The operation of the machine can be best seen from examination of Figures 3 to 6.

5 Figure 3 shows the situation when the arm 25 has moved so that its suction cups 32 have come into contact with the lower carton 14 on the stack, suction, not illustrated, has been applied to the cups and the arm has commenced moving downwardly. At the beginning of
10 this downward movement, the edge of the carton resting on the spring clip or ledge 13, has been drawn downwardly beyond this clip, the next carton 14 on the stack has moved down to rest against the clip so that only one carton is moved, the edge of the carton adjacent the
15 former is still retained on the ledge 12 and the carton is commencing to open. At this time, it will be seen that one pair of pins 17 is moving beneath the chute and will shortly contact the trailing edge of the carton.

20 In Figure 4, the edge of the carton which was held beneath ledge 12 has been moved away therefrom so the carton is completely free from the chute and the remainder of the stack is still there, the carton edge is being drawn over the curved leading portion 20 of the former so that the carton, at this time is substantially
25 fully erected. It will be appreciated that as the carton has been in the collapsed condition for at least some time if it was released when fully erected, there would be a

strong tendency for it to return to its intial condition.

In the condition of Figure 4, the arm 25 is basically moving downwardly and is about to start moving rearwardly.

Considering now Figure 5, the arm 25 has moved
5 further downwardly, has started to move rearwardly and the carton is being deformed in the direction opposite to that in which it is being stacked by the lower portion of the leading edge of the former.

The carton is at this time coming closer to
10 the curved intermediate portion 21 and the pins 17 are coming into abutment with the carton.

In Figure 6, the carton has moved on to the guide 23, suction has been released and the arm 25 is below the level of the guide and the carton is being substantially deformed in the direction opposite to that in which it
15 was originally stacked.

Returning again to the earlier figures, it can be seen that a carton 14' which is the carton that left the chute prior to the carton, the movement of which I have just been describing, is, in Figure 3, passing beneath the intermediate portion 21 of the former and is still, in that Figure, retained basically in its folded condition. In Figures 4 and 5, the carton 14' is in a similar condition, but in Figure 6 it has moved along the trailing 25 edge 22 of the former and is attempting to return to a condition where it is fully erected.

I have found that as cartons leave the former

as in a position slightly after that in which the carton 14' is located in Figure 6, they spring to a basically fully erect condition and one of the ends can be folded in.

5 I have not described the method of folding the ends inwardly but it is basically only necessary to provide guide tracks adjacent the ends so that a first fold is made about the central score line of the end flap so that the outer portion of the flap is folded upwardly and then a second fold is made at the inner score line so that the outer end which has previously been folded upwardly, enters the open end of the carton. A guide means or the like may be provided adjacent the path of movement of the carton after folding has been 10 completed to ensure that folding is in fact correctly 15 completed.

If the carton being erected has tabs, these are folded inwardly prior to the folding movement of the end.

20 Referring again to Figure 6, I have illustrated the path of movement of the suction cap attached to the arm 25 and it can be shown that the movement from the condition shown in Figure 6 to the condition just before that shown in Figure 3, that is the effective return 25 stroke of the arm is relatively rapid whereas the movement from the position shown in Figure 3 to that shown in Figure 5, that is the collection of the carton from the

chute and its movement until it is released from the suction cap, is relatively slow to ensure that it passes cleanly around the former.

This form of movement is most beneficial as it
5 means that the straight reciprocating movement is avoided and thus wear on the components is minimized. Because of the form of movement it will be appreciated that as the suction caps come into contact with the carton, there tends to be a slight rubbing effect and in order to overcome any disadvantage caused by this, I can pivot the
10 chute in such a way that on contact, the chute momentarily moves with the arm and a good suction grip is achieved between the suction cap or caps and the carton.

When the carton is removed, the chute returns
15 to its initial condition and can thus again move on the next cycle.

Cartons as they leave the portion of the machine illustrated in the drawings, pass to a delivery conveyor which may, if required, have means to set the cartons
20 up in a particular orientation to aid filling.

I have not illustrated the drive of the machine as such could be readily designed by any engineer.

I do prefer to drive the whole machine from a single motor so that synchronization of the movement of
25 the feeder arm and the conveyor is readily effected. It will be appreciated that the pins must be in the required position to collect the carton as soon as the

suction is released and cannot be directly beneath the chute when the carton is being removed as the pins would damage the carton and the machine would tend to become blocked.

5 It can be seen that to change sizes of cartons, it is only necessary to change the chute, and in some cases the former and there may need to be a slight adjustment to the width of guides through the machine but such adjustments are relatively simple and can be done by an
10 untrained technician.

The claims defining the invention are as follows:-

1. Apparatus for erecting cartons including a feed chute into which cartons for erection can be placed, restraining means entering into the chute adjacent the open lower end thereof which prevent the cartons from freely leaving the chute, a conveyor passing beneath the open lower end of the chute which is arranged to positively transport cartons when they leave the chute, forming means adjacent one side of the chute and above the conveyor by which cartons on the conveyor are caused to assume a fully erect condition and means to selectively move individual cartons from the open lower end of the chute onto the conveyor adjacent the forming means.
2. Apparatus as claimed in claim 1 wherein the means to selectively move individual cartons from the open lower end of the chute comprise an arm having carton gripping means on its outer end, the arm being moveable from a position at which it removes a carton from the chute, through a position at which the carton strikes the former and is erected to a position at which the carton has been folded beyond the erect position, is on the conveyor and is about to pass beneath the former.
3. Apparatus as claimed in claim 2 wherein the arm is connected, at its inner end, to a crank and has, partway along its length, a link pivotally connected

thereto and to the machine body, the arrangement being such that when a carton is being transported, the movement is relatively slow and largely in a straight line and when the arm is being moved to the position at which it contacts a carton the movement is fast.

4. Apparatus as claimed in claim 2 or claim 3, wherein the carton gripping means comprises at least one suction cup.

5. Apparatus as claimed in any preceding claim wherein the restraining means in the chute comprises a ledge adjacent the former and a ledge or spring means on the other side of the chute, the means being arranged so that a carton being erected remains on the ledge adjacent the former until after the other edge is released.

6. Apparatus as claimed in any preceding claim wherein the conveyor comprises a guideway having a plurality of driven pins passing therethrough, the pins transporting the cartons being erected.

7. Apparatus as claimed in claim 6 wherein the pins are in pairs.

8. Apparatus as claimed in claim 6 or claim 7, wherein there are a pair of chains beneath the guideway, the pins being located on plates which extend between, and beyond, the chains.

9. Apparatus as claimed in any preceding claim wherein the chute and, if required, the former can

readily be removed and replaced to enable cartons
of different sizes to be erected.

10. Apparatus for erecting cartons substantially
as hereinbefore described with reference to the
accompanying drawings.

DATED this 26th day of MAY, 1975.

KARL KLEIN

By his Patent Attorneys:

A. TATLOCK & ASSOCIATES

Fellows Institute of Patent
Attorneys of Australia.









